Methodological Note #009

Telephone Sampling in the 2021 AmericasBarometer

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Key Findings:

- Due to the COVID-19 pandemic, LAPOP Lab transitioned from face-to-face household surveys to telephone surveys for the 2021 AmericasBarometer
- Respondents were selected through random-digit dialing (RDD) samples of mobile telephone numbers
- No stratification or clustering of telephone numbers were used
- To maximize response rates, teams conducted at least 4 callbacks to unanswered telephone calls
- Resulting sample imbalances were corrected with responsive design strategies and weighting

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LAPOP Lab's flagship project is the AmericasBarometer, a biennial study of public opinion in the Latin America and Caribbean (LAC) region, the United States, and Canada. The lab has traditionally carried out LAC surveys in person (i.e., face-to-face).[1] Under that mode, respondents are selected using area probability sampling. As part of the sample design, the lab employs stratification by region and rural and urban areas, and clustering of census segments in a multi-stage selection. The sampling frames in this design are national censuses.[2]

In order to minimize public health risks posed by the COVID-19 pandemic, the 2021 AmericasBarometer LAC region surveys were conducted by computer-assisted telephone interviewing (CATI) rather than face-to-face (FtF). To realize this outcome, LAPOP rebuilt its sampling strategy in order to produce nationally representative samples using state-of-the-art techniques adjusted to address practical limitations to telephone surveying in the region.[3] The approach presented here provides a model for how to effectively implement phone-based sampling in surveys in the LAC region or similar contexts.

The change from a FtF data collection mode to CATI had at least three implications for LAPOP's sampling strategy. The first and most important implication is that new sampling frames were necessary. In contrast to FtF studies in which LAPOP uses a multi-stage selection process (first choosing from primary sampling units, then households, then individuals), telephone studies involve sampling households or individuals directly, depending on whether landlines or mobile phones are called. To build new samples, then, we first needed to decide whether to call landlines, mobile phones, or a mix of both. We also needed to choose a type of sampling frame out of three commonly used options: all possible numbers, listed numbers (i.e., telephone directories), or third-party lists.

A second issue in a move to telephone interviews is that, in mobile phone sampling frames, CATI disconnects the survey from specific geographic locations. Phone number area codes sometimes give information about users' locations, but even where the telephone numbering plans make this possible, respondents could have moved to a new location by the time they participate in the study while maintaining the same telephone number. For this reason, it is difficult to implement regional stratification, a strategy used by LAPOP previously to reduce standard errors compared to a simple random sample of the same size and to allow for reliable estimates of parameters within each region. On the positive side, telephone interviewing makes it possible to include in the sampling frame populations that are otherwise unreachable due to physical, political, or economic constraints[4] and enumerators do not need to travel, which increases fieldwork efficiency and eliminates the need for clustering respondents.

A third consideration has to do with response rates, which are much lower over the phone (typically less than 10% worldwide[5]) compared to FtF interviews (20-30%, on average, in the last two rounds of the AmericasBarometer[6]). We needed to develop a new protocol for recontacts in order to mitigate the response rate issue.

This *Note* describes how LAPOP approached these key considerations for a move from FtF to telephone sampling and, in so doing, explains the decisions made[7] for the 2021 AmericasBarometer in five areas related to sampling:

1. Choosing a single frame (mobile phones only) over a dual frame (both mobile and landline numbers);
2. Using random digit dialing instead of telephone number lists as sampling frames;
3. Not stratifying the sample by region, mobile provider, or other characteristics;
4. The protocol for calling back when a selected respondent did not answer the phone; and
5. Correcting imbalances in the final sample.[8]

Use of Dual or Single Frames

During the 1980s, telephone survey research on landlines was the primary data collection mode in general population surveys in the United States (AAPOR Cell Phone Task Force 2010). With the explosion of mobile phones in the late 1990s and early 2000s, survey methodologists realized they needed to incorporate mobile phone numbers into their sampling frames in order to include groups within the population that started to give up landlines (particularly young adults with higher levels of income and education). As a result, the use of dual sampling frames that include both landline and mobile phone numbers became best practice in CATI studies (Kennedy 2007; Pierannunzi et al. 2013). It was thought that the use of dual frames would mitigate biases that can result from systematic differences between mobile and landline users.

More recently, mobile phone penetration has increased dramatically worldwide, allowing for greater access to populations previously unreachable in phone studies and narrowing the gap between those who do and do not have mobile phones. In parallel, landline subscriptions have been declining. Data from the AmericasBarometer show that from 2004 to 2019, the percentage of households in Latin America and the Caribbean that had access to a landline decreased from 42 to 28 percent. In sharp contrast, the percentage of households with access to mobile phones increased from 33 to 90 percent in the same period. In this context, using a single frame of mobile phone numbers proves to be more efficient. The under-coverage issues that can result from using a single frame may be low, especially if a substantial proportion of landline users are also mobile phone users.

Using a dual frame sampling design also imposes some technical and operational difficulties. The first problem is that the degree of overlap between the two frames is usually unknown when drawing the samples, and this has implications for both sample selection and weighting. When mobile and landline frames overlap, individuals and households with both landline and mobile phones are represented in both frames. This duplication results in higher probabilities of selection (i.e., multiplicity). Multiplicity can be avoided by filtering out the duplicated units from one of the two frames, which is usually achieved by adding filter questions in the questionnaire.[9] Although this approach removes the overlap of the dual frame and thereby makes weighting simpler, in practice it is expensive as it requires additional calls to find the mobile- or landline-only users. Further, it is not well-known *a priori* how many people are both landline and mobile phone users, and how many fall into each sampling frame. Under- or overestimating these quantities can result in inaccurate selection probabilities, and therefore increase standard errors and bias estimates.

A mobile phone-only design also makes the selection process faster and easier, which increases fieldwork efficiency and reduces interviewer error. Landline and mobile phone studies require different selection procedures. Since landlines are attached to households, interviewers must employ an additional within-household selection procedure to choose from all the eligible interviewees (e.g., Kish grid, the last-or-next birthday method, or frequency matching table). When calling mobile phones, on the other hand, the person who answers the call is the (potential) interviewee, so a selection procedure is not used.[10] Due to the difference in selection methods, dual frame studies require interviewers to use two different versions of the questionnaire, which increases complexity and the probability of error. Further, dual frame studies require the addition of questions about phone ownership and usage, increasing interview time.

The potential gain in conducting a dual frame study is coverage. There are some individuals who have only a mobile phone or a landline; one of these groups is excluded in a single frame. To properly account for this issue, we developed a protocol for determining whether the gains in coverage are outweighed by the challenges presented by dual frames.[11] This protocol is as follows: any country in which more than 90% of adults own mobile phones should be assigned a mobile phone frame, as this single frame has sufficiently large coverage to avoid any major biases in estimates of key variables. Conversely, a dual frame should be considered if mobile coverage is below 90%, where coverage issues could lead to a skewed sample. However, a dual frame should only be considered if there is a sufficiently large landline-only population; otherwise, the dual frame would mostly capture the same individuals, and the gains in precision would be negligible and the coverage problems inevitable. We decided that a dual frame should be considered only if the percentage of people with a landline only is greater than 5%.

To help make these decisions, we used data from the 2018/19 round of the AmericasBarometer and consulted with local survey firms. As shown in Table 1, some countries in the LAC region have mobile phone coverage below the 90% mark, including Mexico (82.2%), Guatemala (81.6%), El Salvador (86.9%), Honduras (86.4%), Nicaragua (84.5%), Panama (84%), Peru (86.5%), and the Dominican Republic (88.9%). The actual proportion is likely lower as those excluded from the 2018/19 study (e.g., homeless or reclusive individuals) are less likely to have mobile phones. In these cases, however, using a dual frame would not help solve the issue, as the landline-only population is not larger than 5% in all countries. Given this information, we made the decision to select telephone numbers from a mobile phone only sampling frame. An exception could have been made for Mexico, where 7.7% of households reported having access to landlines only in 2019. However, our local partner indicated that the country's 2020 census asked about phone ownership and found that there is now significant overlap between landline and mobile phone users and that the landline-only mark is below 5%.[12] Therefore, we decided to implement a single frame approach in all LAC countries in 2021.

Table 1: Landline and Mobile phone coverage in the LAC region from AmericasBarometer 2018/19

Country	Mobile phone in HH	Landline in HH	Mobile phone only	Landline only	None	Both
Chile	97.0%	30.8%	67.1%	1.0%	2.0%	29.8%
Costa Rica	96.3%	33.0%	65.1%	1.9%	1.9%	31.0%
Paraguay	95.8%	12.3%	83.6%	0.5%	3.9%	11.8%
Uruguay	95.6%	54.2%	44.4%	2.8%	1.6%	51.3%
Brazil	95.3%	25.3%	71.4%	1.4%	3.3%	23.9%
Jamaica	94.2%	15.2%	79.6%	0.6%	5.2%	14.6%
Bolivia	93.7%	18.8%	76.1%	1.1%	5.1%	17.6%
Argentina	92.5%	47.3%	50.1%	4.8%	2.7%	42.4%
Colombia	92.4%	33.5%	60.6%	1.7%	6.0%	31.8%
Ecuador	90.5%	41.9%	52.5%	4.0%	5.6%	37.8%
Dom. Republic	88.9%	25.5%	66.3%	2.8%	8.2%	22.6%
El Salvador	86.9%	28.8%	61.0%	3.0%	10.1%	25.7%
Peru	86.5%	25.9%	62.2%	1.8%	11.7%	24.1%
Honduras	86.4%	13.0%	75.0%	1.7%	11.9%	11.3%
Nicaragua	84.5%	13.2%	72.0%	0.9%	14.7%	12.3%
Panama	84.0%	26.3%	61.1%	3.6%	12.5%	22.7%
Mexico	82.2%	42.0%	47.9%	7.7%	10.2%	34.2%
Guatemala	81.6%	19.9%	63.3%	1.6%	16.8%	18.2%

Sample Frames: RDD vs. Lists

General population CATI studies usually employ one of three different types of sampling frames to draw samples of telephone numbers. The first sampling frame consists of all possible telephone numbers in a given area; this is usually associated with random-digit dialing (RDD), wherein numbers are generated at random based on the country's telephone numbering plan. Another commonly used sampling frame for telephone surveys is based on listings from publicly available telephone directories. A third potential sampling frame is commercially-maintained directory lists, like a database of subscribers from a telecom provider. Each offers benefits and drawbacks. In this section, we describe the motivations behind our decision to employ RDD in 2021.

CATI surveys using RDD have been considered the "gold standard" for probabilistic sampling in the U.S. and other affluent countries (Lepkowski 1988; Waksberg 1978). RDD offers a truly random way of selecting participants and, in theory, can reach all possible telephone owners in a given country, even unlisted ones. As random sampling, RDD is an equal probability selection method (EPSEM). However, RDD is somewhat logistically inefficient and resource-intensive, as it takes a significant amount of time to call and verify whether a number is valid (i.e., whether the number is in service). Even if mobile phone numbers can be validated with the use of technology (e.g., pulsing mobile phone numbers or using robocalls), it is difficult to distinguish in advance between business telephone lines and personal telephone lines.

Phone directories, on the other hand, are easier and cheaper to manage, since the numbers have already been verified by another source. In addition, phone books and databases maintained by telephone carriers usually separate commercial from household telephone numbers. Theoretically, if all numbers are included in the list (say, all phone users must sign up with a national registry), it achieves full coverage while eliminating the inefficient step in RDD of contacting inactive numbers before reaching an active one. However, phone directories are often incomplete.

LAPOP Lab conducted pilot studies in 2020 using lists from both mobile carriers and third-party vendors, which produced datasets that were heavily skewed toward younger, male, and higher SES respondents. These issues may arise because of systematic differences in the types of individuals who are likely to share phones with others, change numbers often, or use alternative phone plans that are not be listed on official registries (e.g., prepaid phones).

An alternative approach that may balance the pros and cons of lists and RDD is "list-assisted RDD" (Brick et al. 1995; Fahimi, Kulp, and Brick 2009; Nicolaas and Lynn 2002; Tucker, Lepkowski and Piekarski 2002). This technique exploits the structure of phone number blocks to increase the efficiency of RDD. In the U.S., most residential phone numbers are clustered in a small number of "100-blocks" (100 hundred consecutive numbers, from 0 to 99, at the end of an 8-digit combination). List-assisted RDD works by first purchasing a lot of active phone numbers to determine which blocks are most active, then randomly selecting the last two digits for each block. Though this is a creative way of achieving the benefits of lists and RDD, LAPOP decided not to use this approach because number blocks are not assigned consistently and systematically in the LAC region. Furthermore, our survey firm partners did not have experience with this technique, and alternative approaches were more economical.

Given these considerations, we decided to implement RDD from all the possible mobile phone numbers available in each country for the 2021 AmericasBarometer. In coordination with local survey firms, we obtained information on the Telephone Numbering System and the country's numbering plan (or its equivalent). The frame thus includes all possible numbers that can be generated using the root numbers (i.e., prefixes) assigned by the local authorities to telephone companies.

Table 2 includes information on the total number of mobile phone numbers generated by country, sample provider, and the institution in charge of validating numbers.[13]

Table 2: Sample Size and Sample Provider/Validation[14]

Country	Numbers Generated	Sample Provider	Validation Institution
Argentina	608,385	Firm	Intico
Bolivia	100,000	Firm	Firm
Brazil	150,000	Sample Solutions	Sample Solutions
Chile	500,000	Firm	Firm
Colombia	50,000	Intico	Intico
Costa Rica	71,000	Firm	Firm
Dom. Republic	45,000	Sample Solutions	Sample Solutions
Ecuador	33,000	Sample Solutions	Sample Solutions
El Salvador	269,190	Firm	Firm
Guatemala	357,000	Firm	Intico
Guyana	33,000	Sample Solutions	Sample Solutions
Haiti	288,600	Firm	Natcom and Digicel
Honduras	418,380	Firm	Firm
Jamaica	49,500	Sample Solutions	Sample Solutions
Mexico	500,000	Firm	Firm
Nicaragua	334,890	Firm	Firm
Panama	300,000	Firm	Firm
Paraguay	300,000	Firm	Firm
Peru	500,000	Firm	Firm
Uruguay	424,580	Firm	Firm

Sample Stratification in Telephone Surveys

Stratified sampling can be used to improve the accuracy and precision of estimates within sub-groups of the population (strata). In previous rounds of the AB, LAPOP has used stratification by geographic region and urbanization (i.e., urban vs. rural). This is relatively straightforward for face-to-face surveys, where enumerators are sent to predefined geographic areas. Those areas usually correspond to administrative divisions that can be clearly identified in sampling frames and census maps. Stratifying in CATI, on the other hand, is more difficult because the exact location of the respondent is unknown before the interview begins. While landline telephone numbers are often associated with geographic regions that make stratification relatively straightforward, stratifying by geographic areas in mobile phone frames is more complicated because, with a few exceptions,[15] most national numbering plans in the LAC region do not assign area codes to mobile phone carriers.

Instead, numbering plans typically provide a set of root numbers or prefixes to each mobile phone carrier operating in the country. Even in countries where governments assign area codes to mobile phones, high levels of geographic mobility make stratification difficult since survey firms would need to call potential participants in advance to verify their geographic location.

For these reasons, we decided not to pursue geographic stratification for the 2021 AmericasBarometer. Although this strategy offers the opportunity to reach previously unattainable respondents, such as those in remote geographic locations not covered in LAPOP's FtF studies, our non-stratified sample design may be frustrating for those interested in making estimates for specific regions. To overcome this trade-off, our lab took special care to recreate a region variable (*estratopri* -- our primary strata) included in previous rounds using self-reported location data. The 2021 questionnaire included new questions that asked respondents about their state/department/province, their municipality/city/community, and their community's urbanization level (i.e., city, suburbs, town, or rural area). Whenever the appropriate *estratopri* region category could not be clearly derived from these questions, additional questions were added.[16]

We also considered stratification by market size of the country's telecom companies. This would help account for any systematic differences between the customers of different providers. However, most if not all countries in the region have portability laws that allow mobile phone users to transfer their mobile phone numbers when changing carriers. This poses a degree of uncertainty large enough to outweigh the benefits of stratification by carrier. Instead, we collected information about mobile phone operators directly from respondents. By asking respondents directly, this variable also provides current, more accurate information about mobile phone market share, assuming that there is no systematic variation in response rates across mobile carriers.

Callbacks

For mobile phone interviews, pick-up rates tend to be quite low, and, among those who do answer the call, refusal is common. Many mobile phone owners are not readily available for a lengthy interview on the first call and, in the age of the robocall, few are willing to answer a call from a number they do not recognize. If a number is randomly selected from the sampling frame, survey firms should make several reasonable attempts to interview that person before moving on to a different number. Failing to do so could lead to systematic biases in selection, as particular types of people are more likely to be available and willing to answer the phone at certain times of the day. How many callbacks should the interviewers attempt before moving on to a new participant?

Our review of the literature suggests that there is little definitive research on the optimal number of callbacks, but other studies have called back between 5 and 20 times. Some have gone to as many as 35. Some research suggests that there are diminishing returns to additional calls, especially beyond the fifth or sixth (Vicente and Marques 2017).

We decided to require at least four callbacks. This is the same number required by the European Social Survey (European Social Survey 2016) and in line with minimums used by other organizations including Pew (7) and Gallup World Poll (3). AAPOR considers more than five call attempts to be sufficiently large (AAPOR 2016). We did not place an upper limit to allow flexibility for local firms to select an appropriate number of callbacks in their countries. Because of the high use of prepaid mobile phone plans,[17] we expect that calling many numbers more than five times is typically futile. We also required that survey firms make one attempt on the weekend and another in the evening of a weekday to maximize the chances of successfully connecting with the respondent.

We instructed the local firms to allow reschedules and appointments if a (potential) respondent was busy at the time of the initial call. We allowed the local firms to decide whether to leave voicemails when calls were not answered.

Mid- and Post-Fieldwork Adjustments: Checking Sample Balances

As with any AmericasBarometer survey, our goal was to obtain representative data based on the assumption that all individuals in the target population have a known, nonzero chance of being selected for the study. This assumption means that samples should cover all individuals in the target population, and that response rates are relatively high and stable across groups of individuals. However, not all voting-age adults in the LAC region have access to a mobile phone, and non-access is generally correlated with sociodemographic characteristics. In addition, response rates are not only low but may also vary across SES. Together, non-coverage and differential nonresponse may be important sources of survey error.

To mitigate these sources of error, we employed a “responsive design strategy” (Groves and Heeringa 2006).[18] We continuously monitored collected data and paradata with the goal of reducing bias in survey estimates without significantly increasing the costs of the survey.

In the initial phase, we launched pilot studies in each country in order to gather both qualitative and quantitative data about the survey instrument, response rates, costs, and pace of fieldwork. We adjusted the questionnaire, recruitment protocols, and interviewer training based on these pilots. Questionnaire adjustments were also made after fieldwork

launched, in a small number of cases where information obtained during this first stage warranted a change. For example, in one case, respondents expressed concern about having their voices recorded (for quality control) and being asked their location. In response, we stopped recording interviews and moved location questions to the end of the interview in this country. This improved response rates and increased the pace of data collection.

During the main data collection phase for the 2021 AmericasBarometer, we evaluated key indicators when two-thirds of fieldwork was completed. We implemented two principal types of interventions. The first was a filter by questionnaire type. In 2021, LAPOP Lab split its core questionnaire in two parts (Core A and Core B), which were randomly assigned by the data collection software at the beginning of each interview. Although questionnaires were randomly assigned to achieve a 50/50 split, nonresponses and dropouts generated imbalances in the number of completed interviews conducted for each questionnaire in some countries. Therefore, when appropriate at a later stage in the survey, filters for questionnaire type were added to keep the balance between the two questionnaires. Table 3 indicates the countries and dates in which a questionnaire type filter was implemented.

Table 3: Filters Implementation by Country, AmericasBarometer 2021

Country	Filter Type	Sample provider	Dates	Number of Interviews
Argentina	Filter - Region	Filtered out respondents from Buenos Aires Metropolitan Area	N/A	~300
Argentina	Core A filter	Core A filter	04-27-21 to 04-27-21	31
Bolivia	Core A filter	Core A filter	06-15-21 to 06-17-21	40
Bolivia	Filter - Education	Filtered out respondents with university education	05-24-21 to 06-12-21	611
Bolivia	Filter - Education	Filtered out respondents with secondary and university education	06-08-21 to 06-15-21	95
Chile	Core A filter	Core A filter	05-20-21 to 05-22-21	110
Colombia	Filter - Education	Filtered out respondents with university education	05-12-21 to 05-26-21	300
Ecuador	Core A filter	Core A filter	07-07-21 to 07-08-21	192
Costa Rica	Core A filter	Core A filter	05-24-21 to 06-12-21	125
El Salvador	Filter - Education	Filtered out respondents with secondary and university education	05-26-21 to 06-04-21	124
Guyana	Core A filter	Core A filter	06-19-21 to 06-22-21	178
Haiti	Core A filter	Core A filter	06-23-21 to 06-25-21	46
Jamaica	Core A filter	Core A filter	07-08-21 to 07-13-21	199
Nicaragua	Core A filter	Core A filter	08-16-21 to 08-26-21	175
Nicaragua	Core B filter	Core B filter	08-26-21 to 08-30-21	62
Panama	Filter - Education	Filtered out respondents with secondary and university education	04-13-21 to 04-18-21	113
Paraguay	Core A filter	Core A filter	08-17-21 to 08-19-21	171
Dom. Republic	Core A filter	Core A filter	05-26-21 to 06-01-21	80
Peru	Filter - Region	Filtered out interviews from Lima or Callao	02-26-21 to 03-26-21	535
Uruguay	Filter - Education	Filtered out respondents with secondary and university education	03-07-21 to 03-13-21	131
Peru	Core A filter	Core A filter	03-15-21 to 03-26-21	150

The second type of check had to do with sample distributions by region, age, gender, urbanization, and education. These measures were reviewed on a weekly basis at the beginning of fieldwork and twice a week during the last two weeks of fieldwork to identify imbalances with respect to benchmark distributions in censuses, voter registries, or previous rounds of the AmericasBarometer. We used a "design effect due to weighting" (*deff*) estimation to define a threshold for correction of sample imbalances. If the *deff* for any individual variable is 1.5 or greater, an adjustment was applied during fieldwork. This means that if the imbalance is so extreme that it would cause significant variance in the calibration weights produced after fieldwork, the data collection team needed to stop collecting data from an overrepresented group so they could recruit more respondents from the underrepresented group. The first attempt to induce greater balance in the sample distribution is through changing selection procedures before any call is made (e.g., making more calls during weekends or early evening to reach working people, scheduling appointments to conduct the interviews at different times and days, etc.). As a second-best option, we applied filters to directly screen out individuals from the overrepresented group. Though not a strictly probabilistic solution, this method is a quicker way of achieving balance on observable variables. The goal of the filter is to reduce the weighting effect below the identified threshold. As with the questionnaire filter, we applied these filters toward the end of data collection. Table 2 shows the extent to which we implemented filters to correct imbalances in sample distributions by region, and particularly by education, during the course of data collection for the 2021 AmericasBarometer.[19]

Concluding Remarks

Conducting large-scale public opinion studies via CATI in less affluent countries presents a unique set of challenges. Much of the academic literature on survey methodology focuses on studies in the U.S. and Europe and relies on assumptions that primarily hold in those contexts. We followed best practices in designing samples for the 2021 AmericasBarometer. In so doing, LAPOP has created a model set of practices that future public opinion studies using CATI in the LAC region may follow.

This *Note* describes how LAPOP implemented state-of-the-art sampling techniques despite operational challenges. Based on literature reviews, expert advice, previous experience, and pilot studies, the lab decided to use a single frame (mobile phones only) with random-digit dialing and without stratification, including at least four callbacks for non-respondents. Additionally, by following a responsive design approach, LAPOP was able to overcome unexpected challenges, including the correction of sample imbalances using a particular set of predefined thresholds and protocols. With 63,362 interviews collected, the 2021

AmericasBarometer is—to our knowledge—the largest region-wide phone study of democratic attitudes conducted in recent times. The lessons learned from this effort and the data now available can help LAPOP Lab and others continue to innovate over region-specific best practices for telephone surveys.

Appendix

Annex 1: Americas Barometer 2021 Sample Design Guidelines

LAPOP Lab Sample Design Guidelines for Computer-assisted Telephone Interviewing (CATI)

2021 AmericasBarometer Surveys

INTRODUCTION

This document presents the sample design approach that the LAPOP Lab will adopt for the 2021 round of the AmericasBarometer surveys (AB2021). On June 30, 2020, the LAPOP Lab determined that the AB2021 will be carried out using Computer assisted Telephone Interviewing (CATI). The lab made this decision based on the then current situation of the COVID-19 pandemic, and the rather low chances a vaccine would be available and accessible to the majority of the Latin America and Caribbean population by the second quarter of 2021.

This decision has direct implications for the lab's sample design strategy. LAPOP has traditionally designed complex, probability area samples using censuses and voter registries as sampling frames. This strategy has proven to be efficient for Computer-assisted Personal Interviewing (CAPI). For CATI, the lab has identified Random-Digit Dialing (RDD) as the most efficient design to select survey respondents. This method has the advantage of covering a more disperse sample of the population relative to Face-to-Face (FtF), although it only includes individuals who have access to functioning cell phones or landlines. In addition, RDD can more easily incorporate certain hard to reach populations.

The LAPOP Lab requests each survey research institution to use this document as a guideline to generate an RDD sample for the AB2021 in each country of the Americas. The goal is two-fold. First, the lab aims to standardize the sampling strategy across countries. In this way, we seek to minimize the potential effects of having multiple designs on survey estimates. Second, the lab asks each survey institution to fill out the information requested in this document. This information will be later incorporated into technical reports made available on LAPOP's Website.

GENERAL GUIDELINES

I. Universe, Population, and Unit of Observation

Target Population: The survey provides national coverage of voting-age individuals in COUNTRY in 2021.

Population: The survey collects information from a nationally representative sample of voting-age respondents, who are 18 years of age or older (or 16 years of age and older in Nicaragua, Argentina, Brazil, and Ecuador), who are citizens or permanent residents of COUNTRY and have access to a functioning telephone. The study excludes individuals with access only to business telephone lines and people with no cellphone or landline coverage.

In countries where 90% or more of the population have cellphone coverage, the survey company may employ a single sampling frame of cellphone numbers. If cellphone coverage lies between 80 and 90%, the decision about employing single or dual frames (i.e. cellphones and landlines) will be determined on a case-by-case basis, depending on the similarities of the covered and noncovered population. If cellphone penetration is smaller than 80%, then survey companies may employ dual sampling frames. It is important to note that at least 5% of the voting-age population should be landline users only (that is, should not have access to cellphones) in order for a survey institution to employ a dual frame. The LAPOP Lab, in consultation with the survey company, will decide whether to use single or dual frames well in advance of the beginning of data collection.

Unit of Observation: The statistical unit of observation is the individual, even though the survey contains questions that pertain to the household in which the individual resides.

II. Sampling Frame and Sample

The RDD sampling frame corresponds to all possible telephone numbers available in the country. Each company needs to obtain the national Telephone Numbering System and the country's Numbering Plan (or its equivalent) to design the sample. The frame should include all possible numbers that can be generated using (a) root numbers (or prefixes) for cellphones and (b) area codes for landlines (where appropriate). This ensures that no ethnic group or geographical area is intentionally excluded from the sampling frame.

Exclusions: by definition, the sampling frames (cellphones, and landline where applicable) should only exclude voting-age citizens without access to a telephone line, or individuals with access only to business lines. Any other exclusion requires approval from Georgina Pizzolitto (georgina.pizzolitto@vanderbilt.edu) at the LAPOP Lab.

The survey research company does not need to produce the entire sampling frame, because that would mean generating millions of telephone numbers. Instead, the lab asks the company to draw a random sample of at least 300,000 telephone numbers from the full (hypothetical) frame. Some countries may need to select more telephone numbers to achieve the target number of interviews, accounting for working phone number rates, non-response rates, etc. The company will need to validate those numbers later, via automatic or manual phone calls, text messages or any other method in order to exclude both invalid and ineligible numbers (i.e. telephone numbers belonging to businesses). A full description on how the RDD sample was generated must be submit to LAPOP lab as part of the requirements listed below.

LAPOP Lab requests survey companies to submit the final RDD samples drawn for the survey to Georgina Pizzolitto (georgina.pizzolitto@Vanderbilt.Edu) as part of deliverable one (see the Scope of Work for more information). In addition, the lab requests companies to complete and submit the following information regarding the sampling frame and the sample.

Complete and submit the following information regarding the sampling frame and the RDD sample:

- The final RDD samples drawn for the survey as part of deliverable one
- Source of the sample frame, including a detailed description of the telephone numbering system, the national numbering plan, etc.
- A detailed description of the RDD implementation (i.e. as unrestricted RDD, Mitofsky-Waksberg, list-assisted, etc.)
- Description of the phone numbers validation procedure
- Date of the sample frame
- Excluded population
- Cellphone provider market share (include all cellphone providers)
- Cellphone (and landline, where applicable) coverage (including overlap, where available)
- Total number of possible cellphone (and landline) numbers generated (by strata, where applicable)
- Total number of validated cellphone (and landline) numbers (by strata, where applicable)
- Cellphone (and landline) numbers validation method
- Cellphone and landline geographic links: Specify whether telephone numbers are associated to geographic areas - for example area codes for landlines, etc.

Appendix 2: 2021 AmerciasBaromter fieldwork firms by country

Country	Fieldwork Firm AB2021
Argentina	MBC MORI
Bolivia	CIES Mori
Brazil	IBOPE
Canada	The Environics Institute
Chile	Datavoz
Colombia	IPSOS
Costa Rica	CIEP-UCR
Dominican Republic	Gallup República Dominicana
Ecuador	IPSOS
El Salvador	IUDOP-UCA
Guatemala	ASIES
Guyana	The Consultancy Group
Haiti	Dagmar
Honduras	Borge y Asociados
Jamaica	World Wide BPO
Mexico	DATA-OPM
Nicaragua	Borge y Asociados
Panama	CID-Gallup
Paraguay	CIRD
Peru	IPSOS
United States	YouGov
Uruguay	CIFRA

Notes

1. In the early rounds of the AmericasBarometer, the lab carried out telephone surveys in the U.S. and Canada. For recent rounds, LAPOP switched to self-administered online surveys in those two countries. In this methodological note, we exclude the US and Canada to focus on telephone sampling in the LAC region.

2. In some cases, such as Mexico, voter registry information is combined with census data to create the sampling frame.

3. Examples of practical limitations include: a) limited access to working telephones among certain groups of the population (e.g., low SES individuals, those living in rural areas); b) limited technical capacity of certain survey firms to design and implement random-digit dialing; c) inability to stratify samples by region when using mobile phone frames due to the general disconnection between regions and telephone numbers; d) relatively widespread use of prepaid mobile phones with numbers that are deactivated quickly.

4. For example, people living in gated communities, dangerous areas, or physically remote locations like the Galápagos Islands of Ecuador.

5. A report from an AAPOR task force in 2017 by Lavrakas et al. (available here: aapor.org/Education-Resources/Reports/The-Future-Of-U-S-General-Population-Telephone-Sur.aspx) found that mobile phone response rates in the U.S. were 7% and falling, a finding reinforced by another AAPOR Task Force report in 2021 by Olson et al. (see here: https://doi.org/10.1093/jssam/smz062).

6. For more information on response rates in the AmericasBarometer, see Warner and Camargo-Toledo (2019).

7. We are referring to decisions made collectively at the lab. The authors of this note had key input into those decisions, but the entire LAPOP team contributed to the effort.

8. The appendix includes the Sample Design guidelines for CATI that LAPOP developed and shared with survey firms prior to data collection in order to standardize sampling designs (see Appendix 1). For each country, LAPOP has also produced reports that provide a summary of all technical aspects of the study (see project website).

9. In other words, questions can be added in the questionnaire to identify whether respondents selected into the sample from one frame (for example, a landline frame) also have a cellphone number, and that makes them part of the cellphone sample frame.

10. In some cases, multiple people share a single mobile phone. To deal with different selection probabilities, the AmericasBarometer asks respondents to provide the number of users of each mobile phone. This permit results to be weighted to adjust for different selection probabilities.

11. We thank Dr. Raphael Nishimura, Director of Sampling Operations at the Institute for Social Research, for his expert advice on our CATI sampling strategy.

12. Census data would be ideal to help make this decision for all countries, but questions about phone ownership/usage are uncommon in censuses in the region, and only a handful of countries have conducted censuses since 2018/19 (the last round of the AmericasBarometer).

13. Due to variation in call center hardware and software across firms, some companies were able to detect valid numbers (i.e., active mobile phone numbers) automatically through predictive dialing or other methods, while others needed to hire a third party to pre-validate numbers.

14. See Appendix 2 for the list of fieldwork firms involved in the 2021 AmericasBarometer.

15. Exceptions are Argentina, Brazil, and Mexico.

16. For example, in Jamaica, constituencies were previously used to identify regions of Jamaica, but these are largely unknown to people. Instead, we asked for the respondent's parish and then, for some parishes, the district.

17. In Mexico, for example, over 80% of mobile telephone lines come from prepaid plans, according to data from the Competitive Intelligence Unit (see here: https://www.statista.com/statistics/703268/mobile-subscription-prepaid-postpaid-mexico/). Prepaid numbers are more likely to be inactive because subscribers can reach a minute maximum and must renew their plan at regular intervals, while postpaid plans typically include a long-term contract.

18. Groves and Heeringa (2006) define responsive survey designs as those studies that a) pre-identify elements that can affect costs and errors of survey statistics, b) monitor those elements during the initial phases of fieldwork, c) adjust those elements in later phases of fieldwork, and d) combine data collected before and after the adjustments.

19. During dataset processing, LAPOP Lab computes survey weights to correct for unequal selection probabilities, differential response rates, and deviations on key SES variables. For more information, see the forthcoming *Methodological Note* on survey weights.

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As a charter member of the American Association for Public Opinion Research (AAPOR) Trans-parency Initiative, LAPOP is committed to routine disclosure of our data collection and reporting processes. More information about the AmericasBarometer sample designs can be found at vanderbilt.edu/lapop/core-surveys.

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